2.0 ALTERNATIVES

2.1 INTRODUCTION

The National Environmental Policy Act (NEPA) and its implementing regulations as contained in 23 CFR and 40 CFR requires that the Environmental Impact Statement (EIS) process rigorously explore and objectively evaluate all reasonable alternatives to the proposed action. Reasonable alternatives are those that are practical and feasible from a technical and economical standpoint, achieve the Purpose and Need for the project and do not create unacceptable environmental impacts when compared to other alternatives. This chapter summarizes the range of alternatives considered for the Study and the process used to identify and screen the alternatives to identify the reasonable alternatives fully evaluated in this document.

The *Alternatives Development and Screening Report* (RTC, 2011) is incorporated by reference per CEQ 40 CFR 1502.21 and available under separate cover. This report includes additional detailed information about the alternatives development and evaluation process conducted in support of the *Pyramid Highway and US 395 Connector Draft EIS* (Draft EIS). The screening report outlines the three levels of alternatives development and screening that took place as part of the Draft EIS study process—Level 1, Level 2, and Level 3. It describes how alternatives were developed and how they were evaluated on their ability to meet the Purpose and Need for the project, their environmental impact, and their practicality. It also describes how the alternatives were combined to create the four build alternatives included in this Draft EIS.

This report also provides information on why the alternatives that were not carried forward for detailed evaluation were eliminated.

2.2 ALTERNATIVES DEVELOPMENT AND SCREENING PROCESS

A wide range of alternatives was initially developed that included multiple transit technologies on feasible alignments and highway improvements on both existing and new alignments. The process of developing and screening alternatives took into account the following:

- The Purpose and Need for the project, described in Chapter 1.0 *Purpose and Need*.
- Ability to avoid or minimize environmental impacts.
- The regional planning context.
- The reasonableness of an alternative.
- Stakeholder input.
- Public input.
- State and federal requirements.

The Study team used a four-step alternatives development and screening process to identify the candidate alternatives to be studied in detail in the Draft EIS, as shown in Figure 2-1. The four steps included:

1. Develop preliminary alternatives.
2. Conduct screening based on Purpose and Need and fatal flaws (Level 1).
3. Conduct screening based on preliminary comparative analysis (Level 2).
4. Conduct screening based on detailed comparative analysis (Level 3).

The process involved numerous stakeholders and the public. The Technical Advisory Committee (TAC) provided input from 32 stakeholders from a range of organizations and agencies representing a variety of goals and interests. The TAC included representatives of the City of Reno, City of Sparks, U.S. Bureau of Land Management (BLM), U.S. Environmental Protection Agency (EPA), FHWA, NDOT, Reno-Sparks Indian Colony, Regional Transportation Commission (RTC) Washoe, Washoe County, and the Study team members. Also, the public provided comments on alternatives via the extensive public involvement program described in Chapter 4.0 *Comments and Coordination*. The Study team used input from the stakeholders and public to develop screening criteria, develop alternatives, and screen alternatives.

2.2.1 Decision-Making Process

The Study team used a collaborative decision making process to develop consensus among the communities and agencies, including NDOT and FHWA, on the elements in the Draft EIS alternatives. A collaborative decision making process was used because of the need for broad community support and to make the most informed use of limited financial resources available for transportation improvements in the region. Broad community support sets the stage for local agency participation, partnerships, and commitment to implementation through policies, zoning, and adoption of complementary land use and transportation plans. The collaborative decision making process is the mechanism for achieving broad community support for a Preferred Alternative that addresses the Purpose and Need Statement in a manner that allows FHWA and NDOT to take responsibility for the decision and implement it.

The process guidelines were developed through collaboration with stakeholders so that they understood how consensus was to be achieved during the Study. To develop a consensus agreement, the parties must recognize that, given the combination of gains and tradeoffs, the agreement reached is the best one the parties can make at that time. Throughout the process, stakeholders present were asked to indicate their level of support for the decision. If consensus was not possible, the level of support and dissention was noted, and all deliberations and products of the collaboration were considered by NDOT and FHWA as they made decisions about that particular discussion.

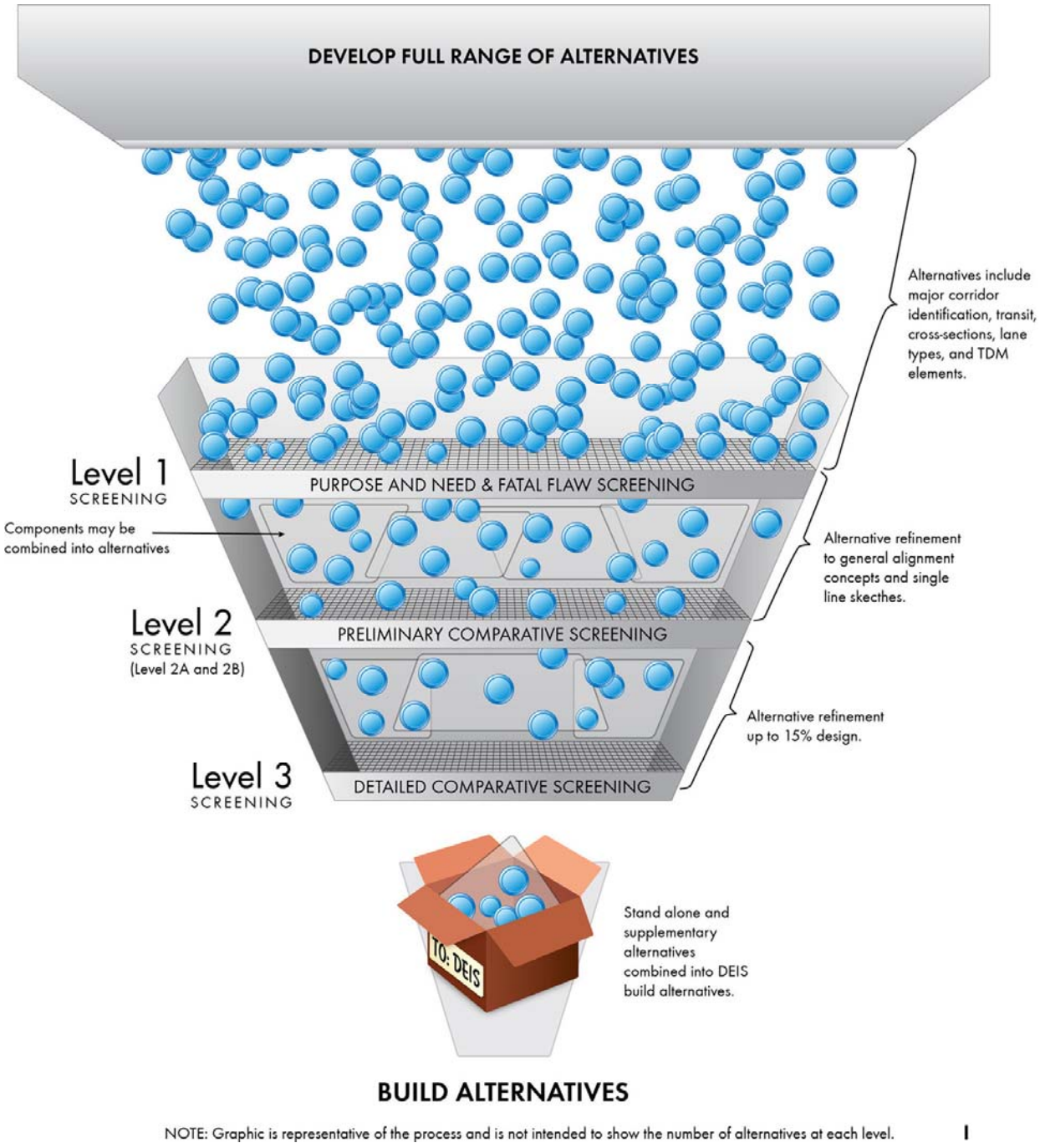


Figure 2-1. Alternatives Screening Process

The discussion process that led to the Draft EIS alternatives entailed the consideration by the TAC and other stakeholders of the Purpose and Need of the project weighed against environmental and other constraints. In support of this effort, the Study team provided data describing these transportation needs to the stakeholders, such as traffic demand and environmental data. The TAC meetings served as the forum for an iterative discussion process involving review and screening of conceptual alternatives based on increasingly detailed design and criteria.

In addition to the TAC meetings, the public outreach activities included five public meetings, agency involvement through five Stakeholder Working Group meetings, and several smaller group meetings that were held as necessary. In this way, a wide range of stakeholders contributed to the development of the Draft EIS alternatives.

2.2.2 Screening Criteria

The screening criteria reflected the elements of Purpose and Need Statement and environmental considerations. They evolved throughout the alternatives evaluation process to meet the level of analysis necessary at each screening level. For each successive level of screening, the criteria used to determine comparative advantages and disadvantages of the various alternatives were more focused and detailed than the prior levels.

2.2.2.1 Level 1 Screening

The Level 1 screening evaluated alternatives on a basic level by examining fatal flaw criteria.

What Happened In Level 1 Screening?

The Study team evaluated the full range of reasonable alternatives, based on ability to meet project Purpose and Need and whether an alternative had any fatal flaws

If an alternative could not meet project purpose and need, it was eliminated as a "stand-alone alternative" but could still be a part of the final alternatives as a supplementary element.

If an alternative had any fatal flaws, it was eliminated from consideration.

At this level of screening, the Study team considered numerous alternatives at a very conceptual level. Many of the alternatives had been identified in the *Pyramid Highway Corridor Management Plan* (*CMP*) approved in 2002. The *CMP* had similar goals as this Study and identified a set of improvements to be included in RTC's 2030 *Regional Transportation Plan* (2030 RTP). Additional alternatives were identified through the scoping process and by the Study team. Alternatives included "system alternatives,"

transit alternatives, roadway improvements, and alternative lane types. System alternatives are those that involved a comprehensive set of regional improvements that could potentially reduce the specific needs for improvements on Pyramid Highway.

The Level 1 screening evaluated alternatives on a basic level by examining fatal flaw criteria. If an alternative had a fatal flaw, it was eliminated from consideration during Level 1 screening. The fatal flaw criteria for Level 1 screening were the following:

- Does the alternative have a fatal flaw of irresolvable environmental impacts?
- Does the alternative have a fatal flaw of exorbitant costs?
- Does the alternative have a fatal flaw of an unproven technology?
- Does the alternative have a fatal flaw of not being constructible?

If an alternative could not meet the project Purpose and Need, it was eliminated from consideration as a stand-alone alternative during Level 1 screening. The Purpose and Need criteria for Level 1 screening were the following:

- Could the alternative meet the Purpose and Need element of providing improvements to serve existing and future growth areas?
- Could the alternative meet the Purpose and Need element of providing direct and efficient travel routes to address existing inefficiencies by improving east-west connections and access to the Spanish Springs and northern Sparks area?
- Could the alternative meet the Purpose and Need element of alleviating traffic congestion?
- Does the alternative meet the Purpose and Need element of responding to regional and local plans for (1) the Pyramid corridor, and (2) improving multimodal options?

Again, the Study team evaluated the alternatives as "stand-alone" alternatives, based on an alternative's sole ability to meet the Purpose and Need for the project. If an alternative did not meet any of the above Purpose and Need criteria, it was screened out and did not continue onto later stages of analysis and evaluation, implying it could not become the Preferred Alternative. However, the Study team recognized that some alternatives that were screened out at Level 1 could ultimately become a part of a build alternative. These alternatives were then considered not as stand-alone solutions, but were recognized as supplemental elements to be considered as an element of one or more of the build alternatives.

2.2.2.2 Level 2 Screening

The Level 2A screening focused primarily on evaluating alternatives based on traffic demand and an initial review of environmental impacts.

What Happened In Level 2 Screening?

The Study team refined the alternatives from Level 1 and evaluated them based on more detailed criteria.

During Level 2A screening, general alignment concepts were evaluated based on preliminary traffic analysis and environmental review.

During Level 2B screening, the general alignment concepts were refined into more specific alignments and evaluated in greater detail, with special attention given to environmental constraints and specific relocations and acquisitions.

The Level 1 alternatives carried forward were refined into general alignment concepts, meaning that specific alignments were determined at a more detailed level. The Study team evaluated both North-South and East-West alignments at this level. In addition to the roadway concepts the Study team refined and evaluated further the supplemental elements identified in Level 1 (alternatives that the Study team determined could not meet Purpose and Need as stand-alone alternatives, but could be part of the build alternatives). The supplemental elements included pedestrian and bicycle facilities, transit services, congestion management practices, and alternative lane types.

Level 2A Traffic Demand Analysis

For the traffic demand analysis, the Study team tied specific criteria to each of the Purpose and Need elements and identified metrics available from the regional travel demand model. The Study team performed the traffic demand analysis after the highway alternatives were run in RTC's regional travel demand model. This model focuses on demand and performance based on demand, volumes, trip characteristics and volume-based performance criteria. The base year of analysis was 2040, consistent with RTC's latest draft Regional Transportation Plan at the time of screening. For modeling purposes, all segments were designated as freeway segments unless otherwise noted in the alternative definitions. Table 2-1 lists the traffic criteria used for Level 2 screening.

Table 2-1. Level 2A Traffic Screening Criteria

P&N Element	Criterion	Analysis Location(s)	Measure
Serve existing and future growth areas	Travel Demand	Representative locations	Average Daily Traffic (ADT) of alternative meets freeway level of demand
Provide Direct and Efficient Travel Routes	East-West Connections	East-West screenline from McCarran to North Valley Connector, including McCarran Boulevard.	ADT to determine level of demand served by alternative
	System Efficiency (Mobility)	Study Area	Vehicle Miles Traveled (VMT) – an indication of overall travel mobility
Alleviate Existing Congestion	Traffic Operations	Pyramid Highway corridor	Vehicle Hours of Delay (VHD) – an indication of travel speeds and mobility
Alleviate Existing Congestion	Travel Time	Pyramid Highway and Eagle Canyon Drive to Pyramid Way/I-80	Peak period travel time – an indication of mobility and congestion
		Pyramid Highway and Eagle Canyon Drive to US 395 and East Golden Valley Road	
		Pyramid Highway and Eagle Canyon Drive to US 395/I-80	
		Pyramid Highway and Eagle Canyon Drive to I-80 & Vista	
	Study Area Level of Service (LOS)	Representative study area segments	Peak hour LOS – an indication of congestion
Respond to Local and Regional Plans	Consistent?	N/A	Yes/No

Level 2A Environmental Review

The alternatives screening considered those environmental resources that had the potential to influence the screening results, listed in Table 2-2. For the environmental review, existing data sets and available resources, such as aerial photography, were used to determine the potential environmental impacts of each alternative. To calculate this information, the Study team used a corridor width of potential impact of 250 feet in urbanized, constrained areas (i.e. 125 feet from the proposed roadway centerline), and used 500 feet in open, unconstrained areas to account for cut and fill impacts. Table 2-2 lists the environmental criteria used in Level 2A screening.

Table 2-2. Level 2A Environmental Screening Criteria

Criteria	Description	Measure
Relocations	Residential and business displacements	Numbers of estimated residential and business relocations
Environmental Justice (EJ)	Effects to disadvantaged populations	Qualitative assessment using U.S. Census Bureau data
Critical Habitat	Critical wildlife and/or plant habitat	Status and qualitative assessment of impact
Wetlands	Impacts to wetlands	Approximate acreage
Water Resources	Impacts to water resources	Approximate linear footage
Floodplains	Impacts to floodplains	Approximate acreage
Historic Resources	Impacts to sites of historic importance*	Number and acreage of sites impacted
Recreation, including Section 4(f) and BLM	Impacts to recreational areas	Approximate acreage

*Based on records search.

After completing the Level 2A screening, the Study team, with concurrence from the TAC, identified a need to conduct additional screening before moving to the more-detailed Level 3 screening. The Study team further refined the general alignment concepts from Level 2A into more specific alignments with greater detail to be analyzed. The Level 2B screening focused on:

- Engineering feasibility.
- Refinement of the traffic demand analysis.
- Environmental impacts.

Level 2B Engineering Feasibility

The engineering screening criteria considered the ability for conceptual alternatives to meet basic the American Association of American Association of State Highway and Transportation Officials (AASHTO) roadway design criteria, particularly for horizontal geometry. Qualitative criteria included assessments of interchange operations, impacts to adjacent roadway networks, spacing of adjacent interchanges, constructability, and flexibility to accommodate future potential improvements.

Level 2B Traffic Demand Analysis Refinement

For the traffic demand analysis, comparative metrics from the regional travel demand model were used. Table 2-3 lists Level 2B screening design and traffic criteria.

Table 2-3. Level 2B Design and Traffic Screening Criteria

Criteria	Description	Measure
Interchange Operations	The functional ability for an interchange to operate at acceptable levels of service (LOS D or better)	Qualitative assessment of the operability and likely level of service of an interchange
Existing Road Network Cohesion	Impacts to the existing or planned roadway network	Qualitative assessment of impacts requiring realignment and/or closure of existing roadways
Interchange Spacing	The distance to adjacent system and service interchanges to allow for proper merging and weaving operations to occur	Physical distance between interchanges
Ability to Meet Design Criteria	Ability to meet pertinent state and federal geometric criteria	Quantitative assessment of the horizontal and vertical geometry with respect to AASHTO and NDOT design criteria
Future Flexibility	Ability to incorporate potential future improvements to the existing and planned infrastructure	Qualitative assessment based on likely locations of future improvement needs and planned projects
Construction Traffic Control	Ability to reasonably accommodate existing traffic during construction	Qualitative assessment based on likely construction methods, sequencing, and travel patterns
Traffic Demand	Ability of the alternative to accommodate traffic volumes	ADT at representative locations

Level 2B Environmental Impacts

Analysis focused on residential and business relocations; utility displacements; and potential impacts to Section 4(f) parks and recreation properties since these resources are of known importance to the immediate communities, to the overall NEPA process and, in the case of Section 4(f) resources, are protected by federal law. Table 2-4 lists the Level 2B screening environmental criteria.

Table 2-4. Level 2B Environmental Screening Criteria

Criteria	Description	Measure
Relocations	Residential, business, and utility displacements	Number of estimated residential, business, and utility relocations
Environmental Justice	Effects to low income and minority populations	Number of estimated residential and business relocations located in areas determined to be of environmental justice concern; Qualitative assessment of potential impacts
Critical Habitat	Critical wildlife and/or plant habitat	Status and qualitative assessment of impact
Wetlands	Impacts to wetlands	Approximate acreage
Water Resources	Impacts to water resources	Approximate linear footage
Floodplains	Impacts to floodplains	Approximate acreage
Historic Resources	Impacts to sites of historic importance	Number and acreage of sites impacted
Recreation, including Section 4(f) and BLM	Impacts to recreational areas	Approximate acreage

2.2.2.3 Level 3 Screening Criteria

Level 3 screening involved greater design, traffic, and environmental detail.

What Happened In Level 3 Screening?

The Study team refined the alternatives from Level 2 and evaluated them based on more detailed criteria.

During Level 3 screening, alternatives were developed into designs and evaluated in greater detail. With more detailed designs, alternatives could be evaluated with greater precision. Alternatives carried forward from Level 3 screening became part of the Draft EIS build alternatives.

Level 3 Engineering

The engineering screening criteria considered the ability for conceptual alternatives to meet basic AASHTO roadway design criteria, particularly for horizontal and vertical geometry. Qualitative criteria included assessments of interchange operations, impacts to adjacent roadway networks, spacing of adjacent interchanges, constructability, and flexibility to accommodate future potential improvements. Level 3 criteria resembled those used in Level 2B. Since the alternatives had undergone refinement to minimize potential impacts, the Study team provided greater detail in the analysis of alternatives. The design level included an analysis of both horizontal and vertical alignment. Roadway alignments were combined to include both north-south and east-west improvements, and supplemental alternatives were evaluated in greater detail.

Level 3 Traffic Demand Analysis

For the traffic demand analysis, the Study team used comparative metrics from the updated RTC regional travel demand model. After the time Level 2B screening was conducted, the RTC changed from a 2040 model horizon year to a 2030 model horizon year in May 2010. At this level of screening, the Study team used results from the 2030 regional travel demand model factored up to 2035 for comparative purposes. The Level 3 analysis focused in greater detail on the refined Level 3 alternatives. Table 2-5 shows the design and traffic criteria used.

Table 2-5. Level 3 Design and Traffic Screening Criteria

Criteria	Description	Measure
Interchange and Freeway Operations	The functional ability for an interchange or freeway to operate at acceptable levels of service	Qualitative assessment of the operability and likely level of service of an interchange or freeway
Existing Road Network Functionality and Accessibility	Impacts to the existing or planned roadway network or access	Qualitative assessment of impacts requiring realignment and/or closure of existing roadways, or closure of access points
Interchange Spacing	The distance upstream and downstream of adjacent system and service interchanges	Physical distance between interchanges to allow for proper merging and weaving operations to occur
Ability to Meet Design Criteria	Ability to meet pertinent state and federal geometric criteria	Quantitative assessment of the horizontal and vertical geometry with respect to AASHTO and NDOT design criteria
Future Flexibility	Ability to incorporate potential future improvements to the existing and planned infrastructure	Qualitative assessment based on likely locations of future improvements to satisfy needs and accommodate existing and planned projects
Traffic Demand	Ability to accommodate 2035 traffic volumes	Comparative ADT at representative locations
Travel Routes	Ability to provide efficient travel routes	Qualitative assessment of out-of-direction travel
Alternative Lane Type Operation	Ability to effectively serve 2035 demand, with lane types that are in accordance with State Law	Comparative alternative lane type and general purpose lane peak period volume
Transit Demand	Ability and suitability to accommodate 2035 person trip demand	Daily ridership estimation
Construction Traffic Control	Ability to reasonably maintain traffic conditions during construction	Qualitative assessment based on likely construction methodologies, sequencing, and travel patterns

Environmental

Similar to the Level 2 screening, the environmental criteria focused on important impacts that could easily be measured using existing information sources and data. However, biological field studies helped inform the Level 3 screening by confirming general wetland locations and the absence of protected species. Table 2-6 lists the Level 3 screening environmental criteria.

Table 2-6. Level 3 Environmental Screening Criteria

Criteria	Description	Measure
Relocations	Residential, business, and utility displacements	Number of estimated residential, business, and utility relocations
Environmental Justice	Effects to low income and minority populations	Number of estimated residential and business relocations located in areas determined to be of environmental justice concern; Qualitative assessment of potential impacts
Recreation, including Section 4(f) and BLM	Impacts to designated recreational areas or BLM-owned land	Approximate acreage
Local Plans	Local plan consistency	Qualitative assessment of alternative's ability to respond to local and community plans

2.3 ALTERNATIVES CONSIDERED

The range of alternatives considered during the first three levels of screening generally fell into the following types of alternatives:

- Arterial Expansion Alternatives
- North-South Alignment Alternatives
- East-West Alignment Alternatives
- Cross-Section Alternatives
- Interchange Locations
- Bicycle and Pedestrian Alternatives
- Transit Alternatives
- Lane Type Alternatives
- Congestion Management Alternatives

While most alternatives considered were not categorized in this way for the actual screening process, they have been grouped together for purposes of clarity in this chapter. The Study team evaluated the alternatives comparatively both together and separately throughout the screening process and either (1) eliminated them from consideration or (2) combined and advanced as parts of the four Draft EIS build alternatives. The *Pyramid Highway/US 395 Connector Alternatives Development Report* provides greater detail regarding all of the considered alternatives (including various combinations not depicted herein) and their screening.

2.3.1 Arterial Expansion Alternatives

The Study team considered two arterial expansion alternatives (or system alternatives) during Level 1 screening. This refers to system-wide efforts to address the purpose and need by adding capacity to arterials throughout the Study Area and included two separate alternatives that were previously evaluated in the CMP, which are described in

Section 2.2.2.1. Table 2-7 shows these alignments and the results of the screening process.

Table 2-7. Arterial Expansion Alternatives

Alternative	Description	Screening
Arterial Widening to Obtain LOS C	Roadway widening occurs in addition to projects contained in the RTP to achieve the adopted level of service C (LOS C), the design standard at the time of the CMP analysis.	**ELIMINATED** in Level 1 because it would not meet the purpose and need elements of improving east-west connections and responding to regional and local plans. This alternative would also have high and irresolvable community and right-of-way impacts (relocations).
Arterial Widening to Obtain LOS E	Widening occurs in addition to projects contained in the RTP to achieve a community wide minimum LOS E.	**ELIMINATED** in Level 1 because it would not meet the purpose and need elements of improving east-west connections, resolving traffic congestion, and responding to regional and local plans. This alternative would also have high and irresolvable community and right-of-way impacts (relocations).

2.3.2 North-South Alignment Alternatives

The Study team considered highway improvements along several alignments to enhance north-south travel in the Study Area that would address the Purpose and Need elements serving growth areas, providing direct and efficient routes and alleviating congestion on Pyramid Highway. Table 2-8 and Figure 2-2 show these alignments and the results of the screening process.

Table 2-8. North-South Alignment Alternatives Screening Summary

Alternative / Map ID No.	Description	Screening
Pyramid Freeway/Expressway Figure 2-2, 6	This alignment would expand or upgrade the existing Pyramid Highway and Pyramid Way to I-80.	**ELIMINATED** in Level 1 because of high and irresolvable community and right-of-way impacts (relocations).
Pyramid On Alignment Figure 2-2, 1	This alignment would expand or upgrade the existing Pyramid Highway through the Study Area.	**INCLUDED** as part of each Draft EIS build alternative north of Sparks Boulevard; and as part of Alternatives 2 and 4.
Pyramid Off Alignment Figure 2-2, 2	This alignment would be constructed west of the existing Pyramid Highway south of Sparks Boulevard.	**INCLUDED** as part of Alternative 1.
Ridge Alignment Figure 2-2, 3	This alignment would be constructed along the ridge to the west of the existing Pyramid Highway south of Sparks Boulevard.	**INCLUDED** as part of Alternative 3.
Sparks Boulevard Figure 2-2, 1	This alignment would include improvements to the existing Sparks Boulevard corridor.	**ELIMINATED** in Level 1 because of high and irresolvable community and right-of-way impacts (relocations).
West Sun Valley Figure 2-2, 2	This alignment would include the construction of a new facility to the west of Sun Valley.	**ELIMINATED** in Level 1 because it would not address key Purpose and Need elements, including reducing traffic congestion

Table 2-8. North-South Alignment Alternatives Screening Summary

Alternative/Map ID No.	Description	Screening
Vista Boulevard Figure 2-2, 3	This alignment would include improvements to the existing Vista Boulevard corridor.	**ELIMINATED** in Level 1 because it would not address key Purpose and Need elements, including the need to accommodate the anticipated traffic demand.
Pyramid/Sparks Boulevard Couplet Figure 2-2, 5	This alignment would include the conversion of Pyramid and Sparks to one-way streets through the Study Area.	**ELIMINATED** in Level 1 because it would not address key Purpose and Need elements, including reducing traffic congestion.
Pyramid/Rock Boulevard Couplet Figure 2-2, 4	This alignment would include the conversion of Pyramid and Rock to one-way streets through the Study Area.	**ELIMINATED** in Level 1 because it would not address key Purpose and Need elements, including reducing traffic congestion, and would have high and irresolvable community impacts.

Three of the north-south alignment alternatives were retained and incorporated into the build alternatives. They are illustrated in Figure 2-2.

Pyramid On alignment. Would be on the existing Pyramid Highway. For areas north of Sparks Boulevard, it is included as part of all build alternatives. For the segment between the proposed US 395 Connector/Pyramid Highway interchange and Sparks Boulevard, it is included as part of Alternatives 2 and 4.

Pyramid Off alignment: Would be constructed west and off of the existing Pyramid Highway. It extends from the proposed US 395 Connector to Sparks Boulevard, traveling behind Walmart, where it joins the existing highway. This alignment is included as part of Alternative 1.

Ridge Alignment. Would be constructed along the ridge west of Pyramid Highway. It extends from the proposed US 395 Connector to Sparks Boulevard, where it joins the existing Pyramid Highway. This alignment is included as part of Alternative 3.

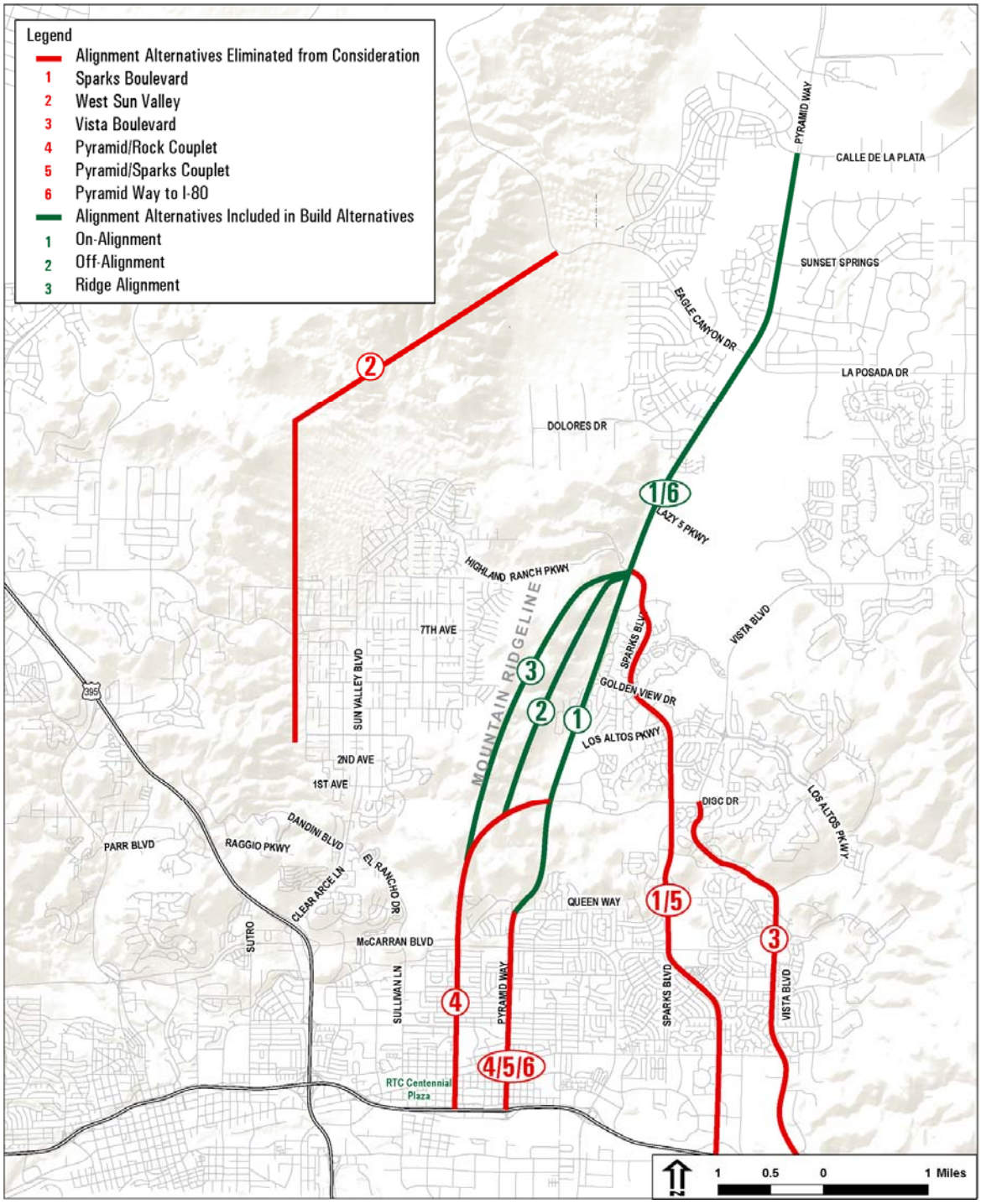


Figure 2-2. North-South Alignment Alternatives

2.3.3 East-West Alignment Alternatives

The Study team considered highway improvements along several alignments to enhance east-west connectivity to US 395 in the Study area, and that would address the several Purpose and Need elements. Alternatives included improvements to existing facilities and the construction of a new limited-access facility. The alignments considered are listed below in Table 2-9 and presented in Figure 2-3.

Table 2-9. East-West Alignment Alternatives Screening Summary

Alternative / Map ID No.	Description	Screening
West of Pyramid Highway		
McCarran Boulevard Figure 2-3, 1	This alignment would include improvements along the existing McCarran Boulevard alignment.	**ELIMINATED** during Level 2 screening because of environmental impacts along McCarran Boulevard, including a high number of residential and commercial property relocations and interchange operations issues at US 395.
Wedekind Road Figure 2-3, 2	This alignment would include improvements along the existing Wedekind Road alignment.	**ELIMINATED** during Level 2 screening because of environmental impacts along Wedekind Road, including a high number of residential and commercial property relocations.
US 395 Connector with Far Northern Sun Valley Crossing Figure 2-3, 3	This alignment would connect to US 395 through Sun Valley near 1st Avenue.	**ELIMINATED** during Level 3 because of a high number of residential and EJ relocations in Sun Valley.
US 395 Connector with Northern Sun Valley Crossing Figure 2-3, 1	This alignment would connect to US 395 through Sun Valley near Rampion Way.	**INCLUDED** as part of Alternatives 1 and 4.
US 395 Connector with Southern Sun Valley Crossing Figure 2-3, 2	This alignment would connect to US 395 through Sun Valley near El Rancho Drive.	**INCLUDED** as part of Alternatives 2 and 3.
East of Pyramid Highway		
Disc Drive Figure 2-3, 3	This alignment would include improvements along the existing Disc Drive alignment.	**INCLUDED** as part of Alternatives 1, 2, 3, and 4.
South of Disc Drive Figure 2-3, 4	This alignment would be constructed on a new alignment south of Disc Drive.	**ELIMINATED** in Level 3 because of Section 4(f) impacts to Wedekind Park.

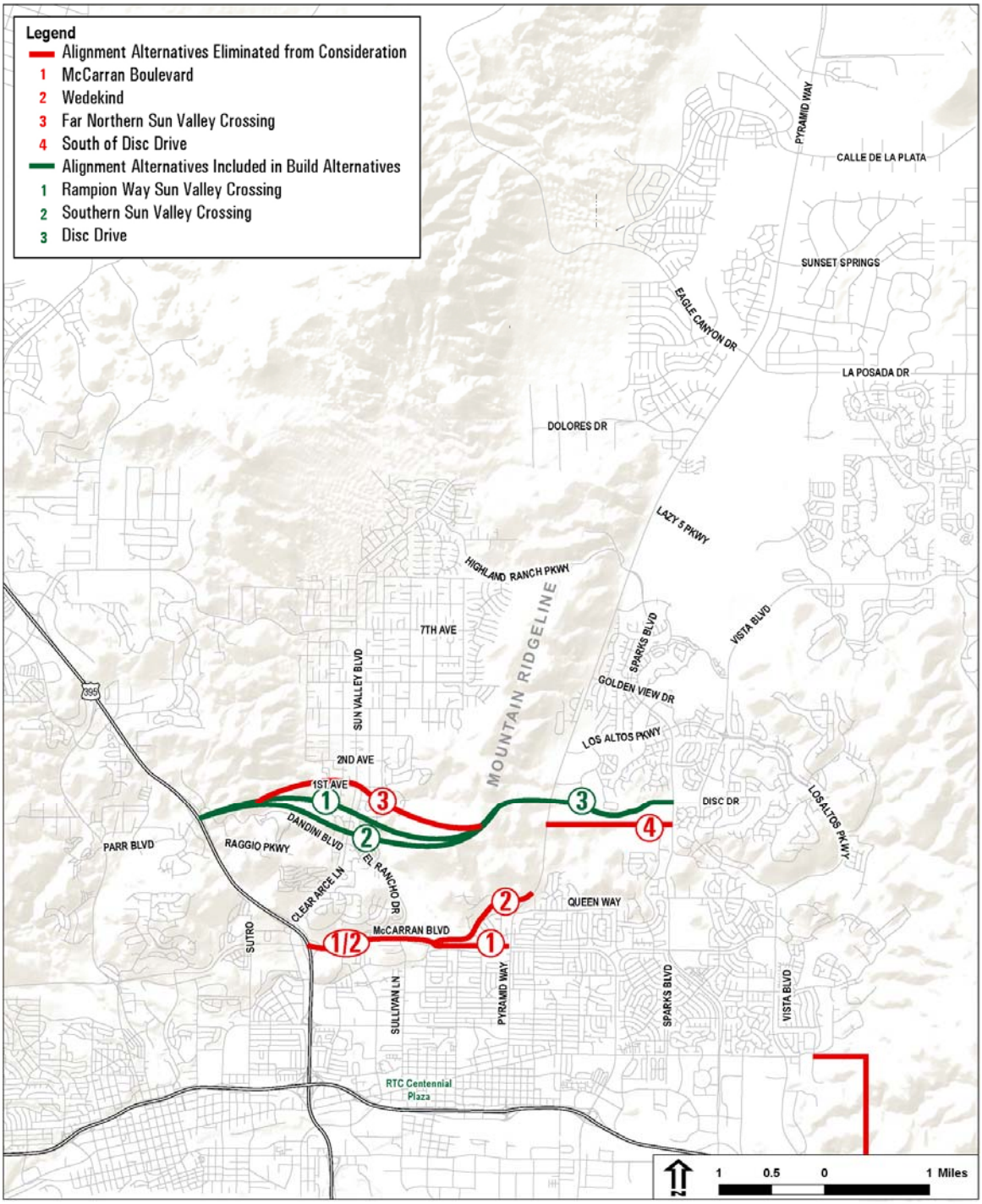


Figure 2-3. East-West Alignment Alternatives

2.3.4 Cross-Section Alternatives

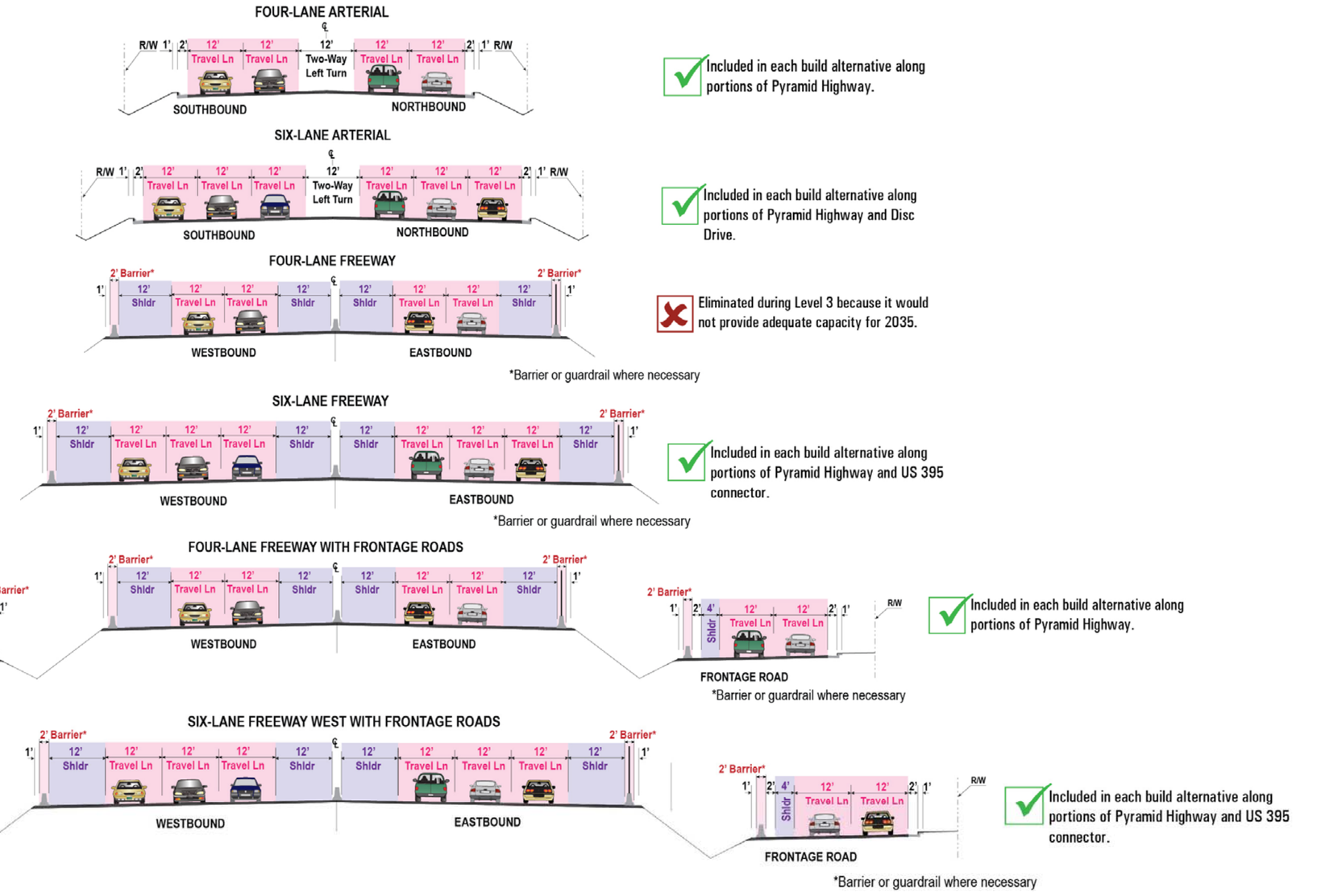
The Study team developed several typical cross-sections to be considered throughout the screening process. These can be simplified into the following categories:

1. Four-lane Arterial
2. Six-lane Arterial
3. Four-lane Freeway
4. Six-lane Freeway
5. Four-lane Freeway with Frontage Roads (one-way and two-way)
6. Six-lane Freeway with Frontage Roads (one-way and two-way)

Travel demand forecasts helped to determine the necessary roadway capacity for each segment of the project. Using NDOT design standards, cross-sections were considered for each major segment along the alignment alternatives throughout the screening process, both north-south and east-west. This process involved balancing capacity needs with environmental constraints to determine appropriate cross section alternatives. Figure 2-4 summarizes the roadway cross-sections and the screening recommendations for the length of the corridor. For simplicity, bicycle and pedestrian facilities are not included in these cross-section illustrations; they are discussed in Section 2.4.3.2 *Bicycle and Pedestrian Improvements*.

Along the main alignments of Pyramid Highway and the US 395 Connector, six-lane freeway cross-sections were needed to accommodate the projected 2035 travel demand. Arterial cross-sections (both four and six lane) were analyzed but it was found that these would not accommodate the demand, and, therefore, would not meet the project need to relieve congestion. It was also found that arterials on these main alignments would not reduce traffic on nearby facilities, such as McCarran Boulevard and Pyramid Way. Figure 2-5 displays the level of service "E" or worse conditions resulting from arterial cross-sections along Pyramid Highway and the US 395 Connector. However, along the alignments of Disc Drive, Pyramid Way, and along Pyramid Highway at the north end of the Study Area, traffic analysis determined that arterial cross-sections would accommodate the projected travel demand.

Conditions of congestion are described in terms of level of service (LOS). LOS can range from "A" through "F", where LOS A indicates free flow conditions and LOS F describes conditions where traffic volumes exceed capacity.



Note: For simplicity, proposed bicycle and pedestrian facilities are not shown on this figure; refer to Section 2.4.3.2 *Bicycle and Pedestrian Improvements*.

Figure 2-4. Cross-Section Alternatives

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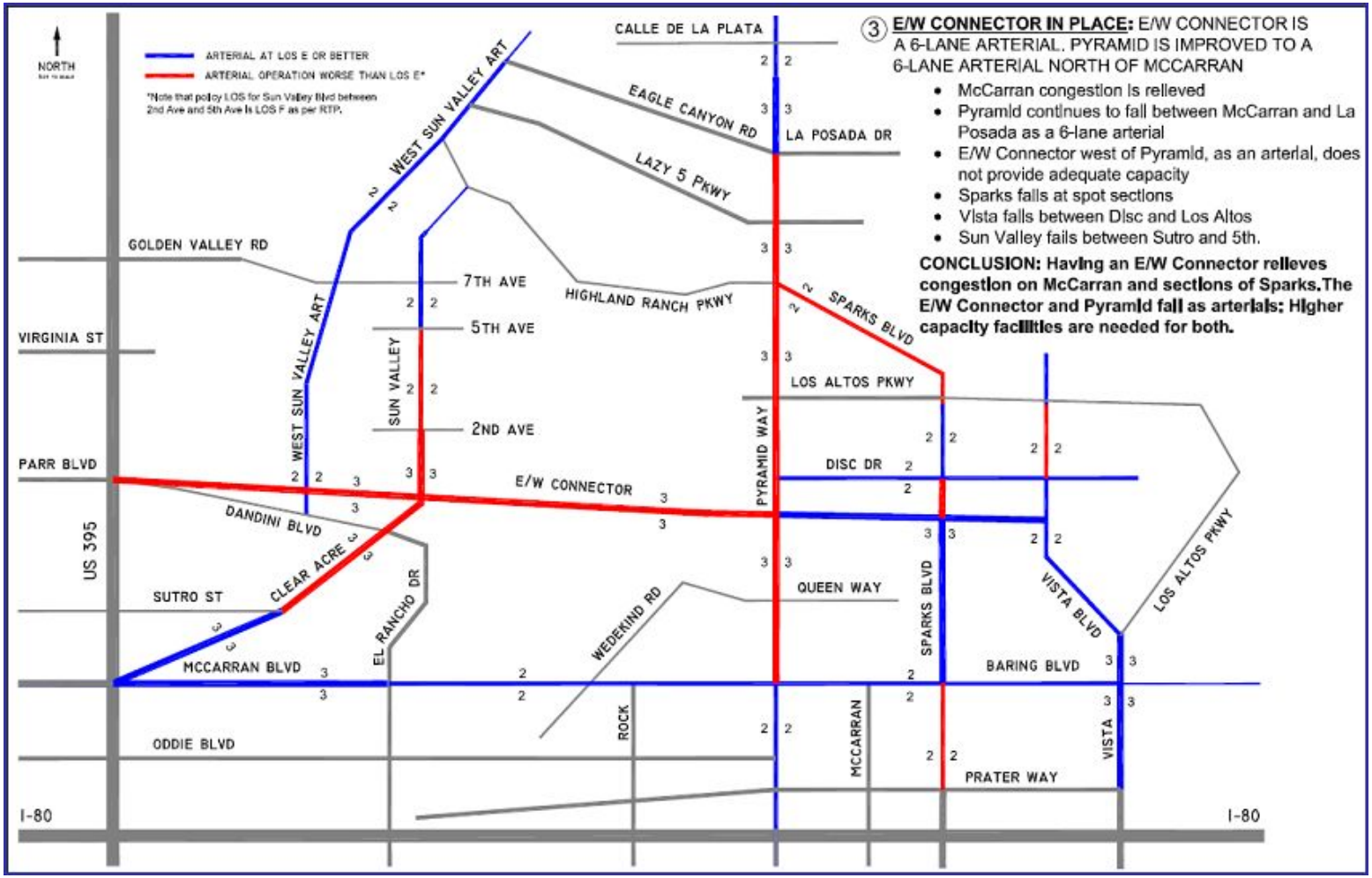

Figure 2-5. LOS with Arterial Cross-Sections

2.3.5 Interchange Locations and Configurations

The Study team determined that for safety and to reduce congestion the proposed roadway warranted greater access control than would be provided by at-grade intersections along an arterial. Therefore, partial and full system and service interchanges were considered for each facility along the study corridors. Interchange locations and the types of interchanges considered are as follows.

System Interchange at US 395/Parr Boulevard/Sutro Street

- At Parr Boulevard—**INCLUDED** in each build alternative because it provides adequate operations and connectivity relative to other options; includes modifications to the Parr Boulevard service interchange.
- North of Parr Boulevard—**ELIMINATED** during Level 3 because it generates the most out-of-direction travel compared to other alternatives.
- South of Parr Boulevard—**ELIMINATED** during Level 3 because of proximity to US 395/North McCarran/Clear Acre interchange creating traffic operational impacts to US 395, has the most relocations of any system interchange alternative, and severely impacts the Desert Research Institute (DRI) master plan.
- Braided (flyover) Southbound Entrance Ramp from westbound connector to southbound US 395—**ELIMINATED** during Level 3 because it is not needed from a traffic standpoint. The slight improvements to freeway operations (weaving) do not outweigh the increased roadway impacts and larger footprint.

West of Sun Valley Boulevard Service Interchange

- Partial Cloverleaf—**INCLUDED** in Alternatives 3 and 4 because it provides access to the Sun Valley area while minimizing the grade issues presented in the other alternatives.
- Diamond Options—**ELIMINATED** during Level 3 because the grade is too steep to meet design criteria.
- Loop Options—**ELIMINATED** during Level 3 because the grade is too steep to meet design criteria.
- Separate Roadways—**ELIMINATED** during Level 3 because the grade is too steep to meet design criteria.

Sun Valley Boulevard Service Interchange

- Tight Diamond or Single Point Urban Interchange—**INCLUDED** in Alternatives 1 and 2 because it provides access to the Sun Valley area while minimizing environmental impacts and grade issues in the other alternatives.
- Split-Diamond with West Arterial—**ELIMINATED** during Level 3 because the grade is too steep to meet design criteria.

- Traditional Diamond—**ELIMINATED** during Level 3 because it would have increased relocation impacts compared to a tight diamond alternative.
- Partial Cloverleaf Options—**ELIMINATED** during Level 3 because they would have increased relocation impacts compared to a tight diamond alternative.
- Direct Connect—**ELIMINATED** during Level 3 because it would have increased relocation impacts compared to a tight diamond alternative.

Disc Drive Service/System Interchange

- Service/System Interchange for Connector/Pyramid Highway/Disc Drive—**INCLUDED** in alternatives (Service interchange for Alternatives 1 and 3; System interchange for Alternatives 2 and 4) because providing the connection between Pyramid Highway, US 395 Connector, and Disc Drive is a key element of the project.

Los Altos Parkway & Golden View Service Interchange

- Tight Diamond without Frontage Roads—**ELIMINATED** during Level 3 because it would not maintain crucial access points along the corridor.
- Split Diamond (ramp pairs at each arterial with connecting one-way frontage roads)—**INCLUDED** in Alternatives 2 and 4. The tight diamond configuration minimizes impacts to adjacent properties while maintaining access to the on alignment section of Pyramid Highway.
- Alternatives 1 and 3 would not provide an interchange to the Los Altos/Golden View area because the off alignment and the ridge alignment do not connect to these roadways and access would be maintained to the existing Pyramid Highway as an arterial street.

Pyramid Highway System Interchange

Directional System interchange—**INCLUDED** in Alternatives 1 and 3. An interchange south of Sparks Boulevard with the existing Pyramid Highway provides directional connection between the off- or ridge alignments of the new freeway, for northbound and southbound Pyramid Highway vehicles.

Sparks Boulevard and Lazy 5 Parkway

- Split Diamond (ramp pairs at each arterial with connecting one-way frontage roads)—**INCLUDED** in each build alternative because it minimizes impacts to adjacent properties while maintaining access to adjoining properties along Pyramid Highway.

Dolores Drive and Eagle Canyon/La Posada Drive

- Separate Diamond Interchanges without Frontage Roads—**ELIMINATED** during Level 3 because the interchange spacing would cause weaving problems and local access would be impacted.

- Partial Cloverleaf Interchange Options—**ELIMINATED** during Level 3 because of inability to meet traffic operations design criteria for frontage roads and impacts to adjoining properties.
- Split-Diamond Interchange (ramp pairs at each arterial with connecting one-way frontage roads)—**INCLUDED** in each build alternative because it maintains good access along the corridor, reduces volumes on Dolores and Eagle Canyon Drive/La Posada Drive, and minimizes right-of-way impacts.

2.3.6 Bicycle and Pedestrian Alternatives

RTC, the Cities of Reno and Sparks, and Washoe County have identified community goals to develop and enhance the bicycle and pedestrian network throughout the community. RTC's *Reno Sparks Bicycle & Pedestrian Master Plan* and *RTC's 2030 Regional Transportation Plan* establish the goal of developing a continuous regional network of safe and convenient bikeways connected to other transportation modes and local bikeway systems; and to provide pedestrian access to existing and planned land uses as part of all transportation projects.

The Study team considered both on-street and off-street facilities throughout the Study Area as part of each build alternative to remain consistent with the 2030 RTP. During each level of screening, pedestrian and bicycle facilities were part of the alternatives considered. While unable to meet the Purpose and Need as stand-alone alternatives, they were carried forward as supplemental elements. Figure 2-6 and Figure 2-7 show the types of bicycle facilities considered. As the screening process progressed, these facility types were considered along each roadway segment and **INCLUDED** based on their ability to best serve each type.

2.3.7 Transit Alternatives

The 2030 RTP has identified a goal to provide multimodal alternatives to increase the percentage of trips in the region made by transit to six percent by 2030. Washoe County and the Cities of Sparks and Reno have also identified a community desire to provide a greater range of multimodal travel options. The Study team, responding to this stakeholder input, included multimodal improvements as part of the Purpose and Need and evaluated several transit alternatives throughout the screening process, ranging from local bus service enhancements to fixed guideway rail systems. Table 2-10 provides a description of each type of transit alternative with a brief explanation for their inclusion or elimination.

On-street bicycle lanes with sidewalks would provide a sidewalk at least five feet wide, and a five-foot bicycle lane. This option works well along slower-speed roadways.

Figure 2-6. On-Street Bicycle Lanes with Sidewalks

Shared-use paths provide a path along roadways shared by all non-motorized traffic. This option works well along faster-speed, limited-access roadways.

Figure 2-7. Shared-Use Paths

Table 2-10. Transit Alternative Screening Summary

Alternative	Description	Screening
Regional Bus	Two major regional bus routes were considered. Both would operate along Pyramid Highway with commuter service. One alternative considered a separate line along the US 395 Connector.	**INCLUDED** the regional bus along Pyramid Highway only, as part of each Alternative
Bus Rapid Transit (BRT)	BRT elements considered for the corridor included slip ramps, queue jumps, frequent service, median stations, and signal priority.*	**ELIMINATED** during Level 3 because the projected ridership of a regional bus (1,000 riders per day) is too low to be suitable for BRT.
Light Rail	Light rail service would run along Pyramid Highway in the north and terminate in downtown Reno.	**ELIMINATED** during Level 1 because corridor density is low so Light Rail would not alleviate congestion, and would have high community impacts.

*Slip ramps = A diagonal ramp, more properly called a cross connection, which connects with a parallel frontage road.
Queue jumps = A type of roadway geometry used to provide priority crossings for buses at intersections, allowing buses to move through intersections before other vehicles.
Frequent service = Bus systems with a lower capacity per vehicle need to provide more frequent services, leading to relatively good timing availability of bus systems.
Median stations = Bus rapid transit center median station with dual outside platforms located in the median at the far side of an intersection.
Signal priority = Designing traffic signals to turn green as transit vehicles approach.

2.3.8 Alternative Lane Types

The Study team considered alternative lane types to general purpose lanes, as follows:

1. High Occupancy Vehicle (HOV) Lanes—**ELIMINATED** during Level 3 because of low peak period demand, minimal travel time savings, and additional impacts.
2. Toll Lanes—**ELIMINATED** during Level 3 because tolling of public facilities is prohibited by State of Nevada law.
3. Reversible Lanes—**ELIMINATED** during Level 3 because of ineffectiveness at serving demand due to the relatively low magnitude of directional traffic imbalance and additional impacts.
4. HOV/Toll Lanes—**ELIMINATED** during Level 3 because tolling of public facilities is prohibited by State of Nevada law
5. Express Lanes—**ELIMINATED** during Level 3 because of ineffectiveness at serving demand due to excessive demand for the express lane, resulting in no travel time advantage and additional impacts.

6. Fast and Intertwined Regular (FAIR) Lanes—**ELIMINATED** during Level 3 because tolling of public facilities is prohibited by State of Nevada law.
7. Truck Lanes—**ELIMINATED** during Level 1 because of low demand, and would not meet the purpose and need element of resolving traffic congestion in the general purpose lanes.

2.3.9 Congestion Management Alternative

The Congestion Management Alternative included strategies to reduce travel demand or improve transportation conditions without physically increasing the roadway capacity. The Study team conducted a thorough analysis of congestion management strategies, which can be viewed in the *Pyramid Highway/US 395 Alternatives Development and Screening Report*. The Congestion Management Alternative would not meet the study Purpose and Need alone, but elements from the alternative would help reduce congestion when implemented in conjunction with the build alternatives.

The following congestion management strategies were included as supplemental elements to enhance the Draft EIS build alternatives:

- **Transit Service**. Each build alternative would provide regional bus service along Pyramid Highway to serve corridor demand consistent with the service standards of RTC. . This bus service would include local stops and major stops at Park and Ride lots. It would operate throughout the day, with 30-minute peak and 60-minute off-peak frequencies.
- **Park and Ride Lots**. Each build alternative would provide Park and Ride lots to serve both transit users and carpoolers along Pyramid Highway at Calle de la Plata, Eagle Canyon Drive/La Posada Drive, and Los Altos Parkway.
- **Bicycle Facilities**. Each build alternative would provide bicycle facilities along the proposed alignment throughout the Study Area.
- **Carpool Lots**. Each build alternative would accommodate carpoolers at the proposed Park and Ride lots.
- **Incident Management Program**. Each build alternative would provide an enhanced incident management program along the new facility by NDOT.
- **Advanced Traffic Management**. Each build alternative would provide variable message signs (VMS) and other advanced traffic management strategies, to be determined during final design.
- **Signal Timing**. Each build alternative would provide improved signal timing, to be analyzed during final design.
- **Ramp Metering**. Each build alternative would provide ramp metering as needed, to be determined during final design.

2.4 ALTERNATIVES ADVANCED

Alternatives that advanced through the alternatives screening process were combined into a set of reasonable build alternatives that were analyzed in greater detail and presented to the various stakeholders and the public for review and comment in this Study. The four build alternatives and a No-Action Alternative are presented in Section 2.4.2 *No-Action Alternative* and Section2.4.3 *Build Alternatives – Common Elements*.

Alternatives advanced for full evaluation in this EIS are:

No-Action

- Alternative 1: Pyramid Off-Alignment with Sun Valley Blvd. Interchange
- Alternative 2: Pyramid On-Alignment with Sun Valley Blvd. Interchange
- Alternative 3: Pyramid Ridge Alignment with West Sun Valley Blvd. Interchange
- Alternative 4: Pyramid On-Alignment with West Sun Valley Blvd. Interchange

2.4.1 Logical Termini

The Study team identified logical termini or end points for improvements at the onset of the Study. Although the need to consider all reasonable alternatives resulted in alternatives that extended beyond these logical termini, the alternatives advanced in the Study have end points similar to those termini defined early in the process.

The following termini serve as rational end points for transportation improvements and for review of the environmental impacts:

- **Western Terminus**. Just west of US 395 near the US-395/Parr-Dandini interchange, encompassing improvements needed to that interchange from a US 395 Connector.
- **Southern Terminus**. Pyramid Highway/Queen Way Intersection. Queen Way serves as the northern terminus for the McCarran Boulevard/Pyramid Highway Intersection EIS. South of Queen Way, the Pyramid Way corridor is in a physically constrained, residential/commercial area where considerable access is needed. North of Queen Way, the character of the corridor changes significantly, transitioning to a more open, less developed area that would accommodate more access control.
- **Northern Terminus**. Intersection of Pyramid Highway with Calle de la Plata. Considerable traffic feeds into Pyramid Highway from this major arterial crossing, thus providing a logical terminus.
- **Eastern Terminus**. Vista Drive, an arterial servicing the eastern portion of the Study Area.

These logical termini allow for development of a project that can be constructed alone, serving a significant purpose, without requiring implementation of other future transportation projects.

2.4.2 No-Action Alternative

The No-Action Alternative assumes completion of those reasonably foreseeable transportation, development, and infrastructure projects that are already in progress; are programmed by NDOT or FHWA, Washoe County, the Cities of Reno and Sparks; or are included in the fiscally constrained *2030 RTP*, with the exception of improvements proposed in conjunction with this Study. These improvements would be made whether or not any other improvements are made in conjunction with this Study and were included as the base case for all analyses, including traffic analyses. This alternative is fully evaluated and is used as a baseline comparison for environmental analysis purposes. Under the No-Action Alternative, improvements within the Study Area would consist of planned roadway modifications and additions. The improvements would be locally or regionally funded, and are reasonably foreseeable.

In the Study Area, the projects shown in Figure 2-8 are included in the No-Action Alternative. Of note, the Pyramid Highway/McCarran Boulevard intersection is currently being studied by others as part of the environmental process to determine proposed improvements. Other notable projects in the vicinity of the Study Area included in the No-Action Alternative include:

- Pyramid Way/McCarran Boulevard intersection improvements.
- West Sun Valley Arterial as a new four-lane arterial.
- North Connector, as a new two-lane road between Sun Valley Boulevard and Lemmon Drive.
- Widening of various segments of US-395 to six, eight, or ten lanes.
- Widening of arterials from four to six lanes, including segments of Clear Acre Lane, Sun Valley Boulevard, Sparks Boulevard, and Vista Boulevard.
- Widening of arterials from two to four lanes, including segments of Parr Boulevard, Sutro Street, and Vista Boulevard.
- Lazy 5 Parkway as a new four-lane arterial.
- Kiley Ranch Road and Stone Brook Parkway as new two-lane arterials.
- Sutro Street Extension with a new interchange with US 395.

Some of the No-Action improvement projects in the Study Area would directly connect to potential improvements in the Pyramid Highway and US 395 Connector corridors. Notably, the McCarran Boulevard/Pyramid Way intersection project has been determined to have independent utility that will improve the traffic operations at the localized intersection, but does not address the defined purpose and need elements of the Pyramid Highway/US 395 Connection project. Also, the West Sun Valley Arterial at its southern terminus would connect to the potential US 395 east-west connector. The West Sun Valley Arterial does not address the needs of the Pyramid corridor or the east-west US 395 connector needs.

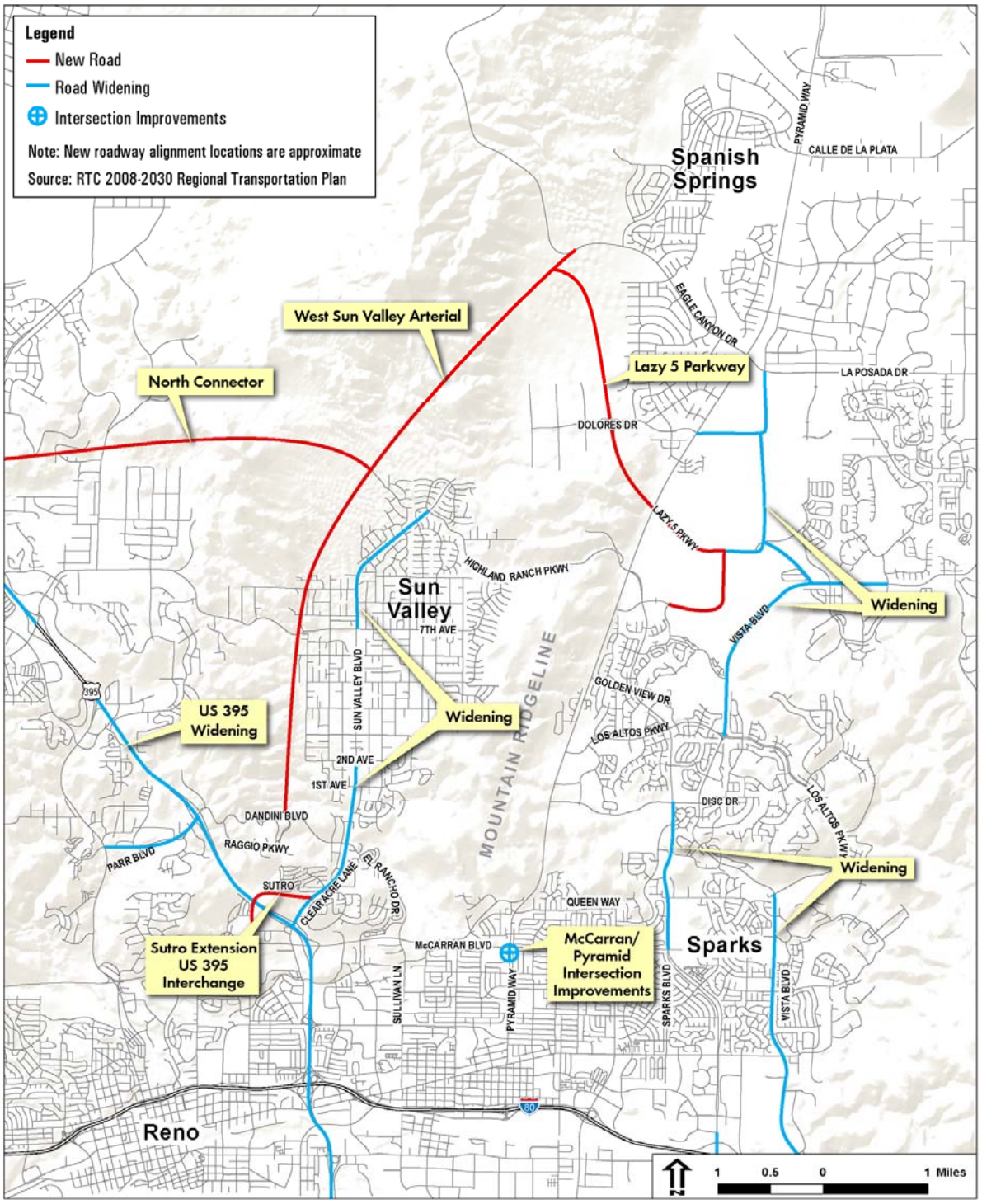

Figure 2-8. No-Action Alternative Improvements

2.4.3 Build Alternatives—Common Elements

The alternatives considered in the Level 1, 2, and 3 screening processes and further advanced were combined into four build alternatives.

There are elements common to each of the four build alternatives, which are described in this section. Sections 2.4.4 *Alternative 1* through Section 2.4.7 *Alternative 4* describe the differences between each alternative.

Each of the build alternatives would provide a similar set of improvements along 7.7 miles of Pyramid Highway from Queen Way north to Calle de la Plata Drive through the communities of Sparks and Spanish Springs. However, the alternatives differ regarding alignments for the US 395 Connector, interchange locations, and cross-sections through much of the Study Area.

In addition to roadway improvements, supplemental elements included in each build alternative include bicycle and pedestrian facilities; increased transit services, including park-and-rides; and Intelligent Transportation Systems. North of Sparks Boulevard, the build alternatives each follow the same alignment along the existing Pyramid Highway. Figure 2-9 displays the elements common to all build alternatives.

ITS (Intelligent Transportation Systems) uses advanced applications of electronics and communications, such as enhanced traveler information and variable message signs, to improve traffic operations and increase roadway effectiveness.

2.4.3.1 Roadway Improvements

Each build alternative would include a new freeway facility and ancillary improvements from Pyramid Highway to US 395, through the Sun Valley area. Both the US 395 Connector and Pyramid Highway north to Eagle Canyon Drive/La Posada Drive would be constructed as limited-access freeway facilities, with interchanges at major intersecting roadways. Pyramid Highway from Eagle Canyon Drive/La Posada Drive to Calle de la Plata Drive is included as a primary arterial highway.

The US 395 service interchange at Parr Boulevard would be reconfigured to accommodate a new system interchange for the US 395 Connector. Raggio Parkway and Dandini Boulevard would be realigned in this area.

Each build alternative would have the following cross-sections:

- Four-lane Arterial
  - Along Pyramid Highway between Calle de la Plata and Sunset Springs.

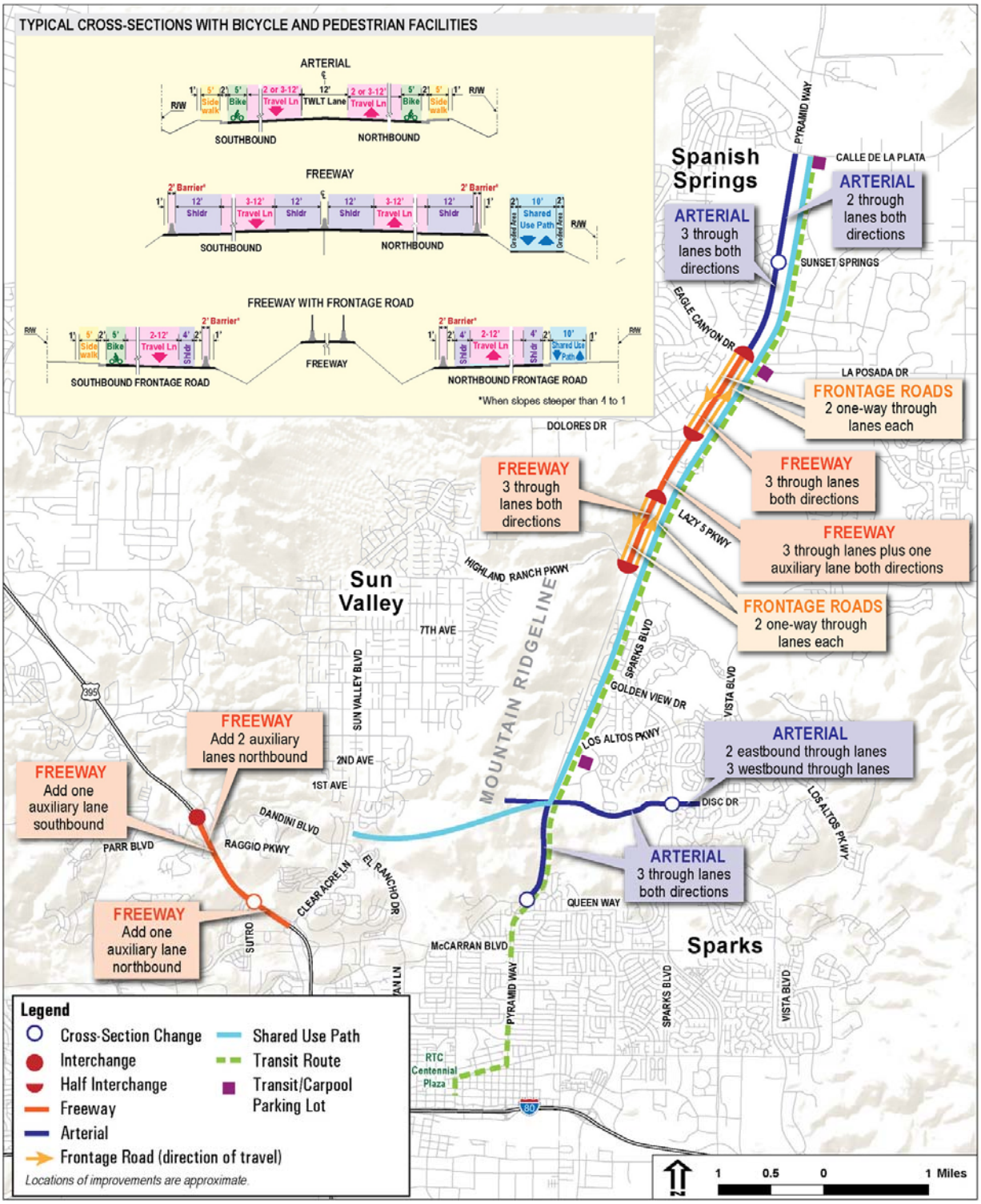

Figure 2-9. Elements Common to All Build Alternatives

- Six-lane Arterial
  - Along Pyramid Highway between Sunset Springs and Eagle Canyon Drive/La Posada Drive.
  - Along Pyramid Highway between Disc Drive and Queen Way.
  - Along Disc Drive between Pyramid Highway and Sparks Boulevard.
- Five-lane Arterial
  - Along Disc Drive between Sparks Boulevard and Vista Boulevard
- Four-lane/Six-lane Freeway with Frontage Roads
  - Along Pyramid Highway between Eagle Canyon Drive/La Posada Drive and Dolores Drive.
  - Along Pyramid Highway between Lazy 5 Parkway and Highland Ranch Parkway.
- Six-lane Freeway with auxiliary lanes
  - Along Pyramid Highway between Dolores Drive and Lazy 5 Parkway.

Each build alternative would include interchanges at the following locations:

- Eagle Canyon Drive/La Posada Drive and Dolores Drive: split-diamond interchange.
- Lazy 5 Parkway and Highland Ranch Parkway: split-diamond interchange.
- US 395 Connector/US 395/Parr Boulevard: at the Parr Boulevard location.

Each build alternative would include construction of auxiliary lanes on US 395 between the US 395 Connector and McCarran Boulevard.

2.4.3.2 Bicycle and Pedestrian Improvements

Each build alternative would include the construction of an off-street shared-use path along Pyramid Highway between Calle de la Plata and Disc Drive. This path would continue west from Disc Drive to Sun Valley Boulevard along the US 395 Connector alignment. At Sun Valley Boulevard, the shared-use path would terminate. The Study Team evaluated continuing the shared-use path west, but determined it was not feasible due to engineering constraints (e.g., steep grades) and increased property impacts. (See the *Alternatives Development and Screening Technical Report* for details). Pedestrians and bicyclists wishing to continue westward would use the on-street sidewalks and bike lanes provided as part of the improvements. Bike lanes and sidewalks on both Sun Valley Boulevard and Dandini Drive would be provided to allow those bicyclists and pedestrians access to TMCC and DRI campuses. The placement of these facilities would improve existing connectivity because Dandini Drive does not currently provide bike lanes or sidewalks.

2.4.3.3 Transit Improvements

Each build alternative would include the addition of regional bus service along Pyramid Highway and Prater Boulevard between Calle de la Plata and the RTC Centennial Plaza, to serve corridor demand consistent with the service standards of RTC. The build alternatives also would include the construction of transit/carpool lots near the Pyramid Highway alignment at Calle de la Plata, Eagle Canyon Drive/La Posada Drive, and Los Altos Parkway. These parking facilities would be open to both transit users and travelers wishing to meet for a carpool. At Calle de la Plata, the lot would be located in the southeast quadrant of the intersection; at Eagle Canyon/La Posada Drive, the lot would be located in the southeast quadrant of the intersection; at Los Altos, the lot would be shared with the Walmart parking lot, requiring coordination with Walmart. If Walmart does not agree to share the parking lot, an alternate site may be identified in the Final EIS.

2.4.3.4 Bridges

Each build alternative would include the construction of many structures in the Study Area. Bridges and retaining walls would be built or modified to accommodate the proposed improvements.

Bridges would be required at each interchange along the corridor. The bridges included in each build alternative are listed below.

Because of the high number of bridges and the design effort required for each, bridge design will continue after identification of a Preferred Alternative in the Final EIS.

The order of bridges given follows the alignment from the interchange at US 395 east and north to Calle de la Plata. The total number of bridges given includes those common to all alternatives.

- **Bridges Common to all Build Alternatives**
  - US 395 Interchange at Parr Boulevard
    - Parr Boulevard over US 395 (replacement of existing structure)
    - Raggio Parkway over NE Ramp (NE = North to East)
    - WS Ramp over US 395
    - SE Ramp over WS Ramp
    - SE Ramp over P-4 Ramp (Parr service interchange south off ramp)
    - WN Ramp over Raggio Parkway (occurs twice, two separate bridges)
    - SE Ramp over Raggio Parkway
    - WS Ramp over Raggio Parkway
    - WS Ramp over P-2 Ramp (Parr service interchange north off ramp)
  - Pyramid freeway over Sparks Boulevard
  - Pyramid freeway over Lazy 5 Parkway
  - Pyramid freeway over Dolores Drive
  - Pyramid freeway over Eagle Canyon Drive/La Posada Drive

- **Alterative 1 (Total Structures for Alternative 1 = 19)**
  - Raggio Parkway over connector freeway
  - US 395 Connector freeway over Sun Valley Boulevard
  - US 395 Connector freeway over Leon Drive
  - US 395 Connector freeway over Disc Drive
  - US 395 Connector Py-2 (Southbound off ramp to Pyramid)
- **Alternative 2 (Total Structures for Alternative 2 = 20)**
  - Raggio Parkway over connector freeway
  - US 395 Connector freeway over Sun Valley Boulevard
  - US 395 Connector freeway over Disc Drive westbound on ramp
  - US 395 Connector freeway over southbound Pyramid frontage road
  - Pyramid freeway over Los Altos Drive
  - Pyramid freeway over Golden View Drive
- **Alternative 3 (Total Structures for Alternative 3 = 20)**
  - West Sun Valley Interchange:
    - Raggio Parkway over connector freeway
    - Connector freeway over West Sun Valley Arterial
    - West Sun Valley eastbound off ramp flyover over connector freeway
  - US 395 Connector freeway over Sun Valley Boulevard
  - US 395 Connector freeway over Disc Drive westbound on ramp
  - US 395 Connector Py-2 (Southbound off ramp to Pyramid)
- **Alternative 4 (Total Structures for Alternative 4 = 24)**
  - West Sun Valley Interchange:
    - Raggio Parkway over connector freeway
    - US 395 Connector freeway over West Sun Valley Arterial
    - West Sun Valley eastbound off ramp over West Sun Valley Arterial
    - West Sun Valley eastbound off ramp flyover over connector freeway
  - US 395 Connector freeway over Sun Valley Boulevard
  - US 395 Connector freeway over Leon Drive
  - US 395 Connector freeway over Disc Drive westbound on ramp
  - US 395 Connector freeway over southbound Pyramid frontage road
  - Pyramid freeway over Los Altos Drive
  - Pyramid freeway over Golden View Drive

2.4.3.5 Retaining Walls

Retaining walls would be constructed where necessary along the corridor to eliminate or minimize impacts. The design plans in Appendix C *Design Plans* show specific locations. Table 2-11 lists and describes the preliminary proposed retaining walls for each build alternative.

The exact location and design of retaining walls have not been finalized and will be determined after the selection of a preferred alternative in the Final EIS.

Table 2-11. Proposed Retaining Wall Locations

Interchange	Build Alternative	Location	Approximate Length	Approximate Average Height	Approximate Maximum Height	Comments
US 395 System	Same for the four build alternatives	P1-Along Parr service southbound on-ramp	525 feet	15 feet	34 feet	This wall has significant variations in height due to the grading of the surrounding properties. Placed to minimize right-of-way acquisition.
		P2-Along US 395 westbound to southbound system on-ramp	350 feet	10 feet	17 feet	Placed to avoid right-of-way acquisition.
		P3-Along southbound US 395	850 feet	18 feet	27 feet	Placed to eliminate need for lengthy sliver cut and avoid impacts into adjacent properties.
		P4-Along southbound US 395 just north of Sutro Street	740 feet	20 feet	32 feet	This wall has significant variations in height. Placed to minimize right-of-way acquisition.
Sun Valley	Build Alternative 2	Sun Valley south of Rampion Way Crossing Wall near Wild Creek Park	320 feet	15 feet	25 feet	Eliminates direct impacts to Wild Creek Park.
	Build Alternative 2	Sun Valley south of Rampion Way Crossing at Leonesio Drive	310 feet	10 feet	12 feet	Placed to avoid right-of-way acquisition.
	Build Alternative 2	Sun Valley south of Rampion Way Crossing at Leonesio Drive	225 feet	8 feet	15 feet	Placed to avoid right-of-way acquisition.
	Build Alternatives 3 and 4	Wall along W. 1st Avenue at Lois Allen Elementary School for the West of Sun Valley Interchange alternatives	320 feet	11 feet	19 feet	Minimizes impacts to the playground area and driveway access to Lois Allen Elementary School.
Pyramid Highway	Build Alternative 1	Wall behind Walmart	835 feet	24 feet	56 feet	Wall height varies significantly to mitigate impacts to existing cut slope behind Walmart.
	All Alternatives	Wall along northbound Pyramid Mainline near Lazy 5 Regional Park	450 feet	10 feet	15 feet	Minimizes impacts to the Spanish Springs Community Library parking area.

Table 2-11. Proposed Retaining Wall Locations

Interchange	Build Alternative	Location	Approximate Length	Approximate Average Height	Approximate Maximum Height	Comments
	All Alternatives	Wall along northbound Pyramid Mainline near Tierra del Sol Parkway	50 feet	5 feet	6 feet	Placed to avoid impacting existing local streets.
	All Alternatives	Wall along northbound Pyramid Mainline north of Eagle Canyon/La Posada/Pyramid intersection	615 feet	35 feet	38 feet	Placed to avoid right-of-way acquisition.
	Build Alternatives 2 and 4	Wall along northbound on-ramp at Golden View Drive	925 feet	Varies from 17 feet in cut to 22 feet in fill	35 feet	Placed to minimize right-of-way acquisition.
	Build Alternatives 2 and 4	Wall along mobile home park	380 feet	28 feet	34 feet	Placed to minimize right-of-way acquisition.
	Build Alternatives 2 and 4	Wall along mobile home park	565 feet	20 feet	29 feet	Placed to minimize right-of-way acquisition.
	Build Alternatives 1 and 3	Wall near where off and ridge alignments split from Pyramid Highway	740 feet	35 feet	40 feet	Placed to avoid right-of-way acquisition.
	All Alternatives	Disc Drive between Sparks Boulevard and Vista Boulevard, south side	1200 feet	6 feet	10 feet	This wall will likely be higher than indicated but any additional height will be used as a traffic noise barrier instead of a retaining wall. Placed to avoid right-of-way acquisition.

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2.4.3.6 Traffic Noise Barriers

Traffic noise barriers would be constructed to mitigate traffic noise impacts per regulation and policy. See Section 3.9 *Traffic Noise* for details.

2.4.3.7 Screening Walls

Screening walls would be constructed to mitigate visual impacts in Environmental Justice areas caused by construction of proposed roadway improvements, if supported by the affected neighborhoods. These screening walls also might provide some traffic noise reduction.

2.4.3.8 Water Quality and Drainage Improvements

Each build alternative would include construction of water quality and drainage improvements. These would include the construction, or replacement, of culverts, inlets, and ditches along the impacted roadways, as well as the construction of permanent water quality basins. Section 3.10 *Water Resources and Water Quality* and the *Conceptual Drainage Report* provide greater detail on these improvements. A summary of the number of facilities required by alternative is provided in Table 2-12.

Table 2-12. Water Quality and Drainage Facilities

Alternative	Culverts	Ditches	Water Quality Ponds—Number (Cumulative Approximate Acre-Feet)	Ditch/Channel Relocation
Alternative 1	37	23	11 (84)	1
Alternative 2	24	22	11 (85)	2
Alternative 3	34	28	11 (88)	1
Alternative 4	27	21	11 (84)	2

2.4.3.9 Earthwork

Earthwork refers to the excavation and piling of earth in connection with an engineering operation. Earthwork quantities for each build alternative were calculated for the US 395 Connector, the Pyramid Highway corridor, all interchange locations, and for any changes to the local roadway network. This included those items typically included in a roadway section such as travel lanes, bikes lanes, shoulders, sidewalks, and roadside ditches. The analysis does not account for walls placed as a mitigation measure for impacts to adjacent properties, nor does the analysis account for earthwork quantities associated with permanent water quantity/quality basins. Table 2-13 shows the approximate net earthwork volumes for each build alternative. Each alternative results in large quantities of excess earthwork requiring disposal.

Table 2-13. Build Alternative Net Earthwork Volumes

Build Alternative	Net Earthwork Volume (cubic yards)
Alternative 1	3,950,000
Alternative 2	6,390,000
Alternative 3	3,010,000
Alternative 4	3,450,000

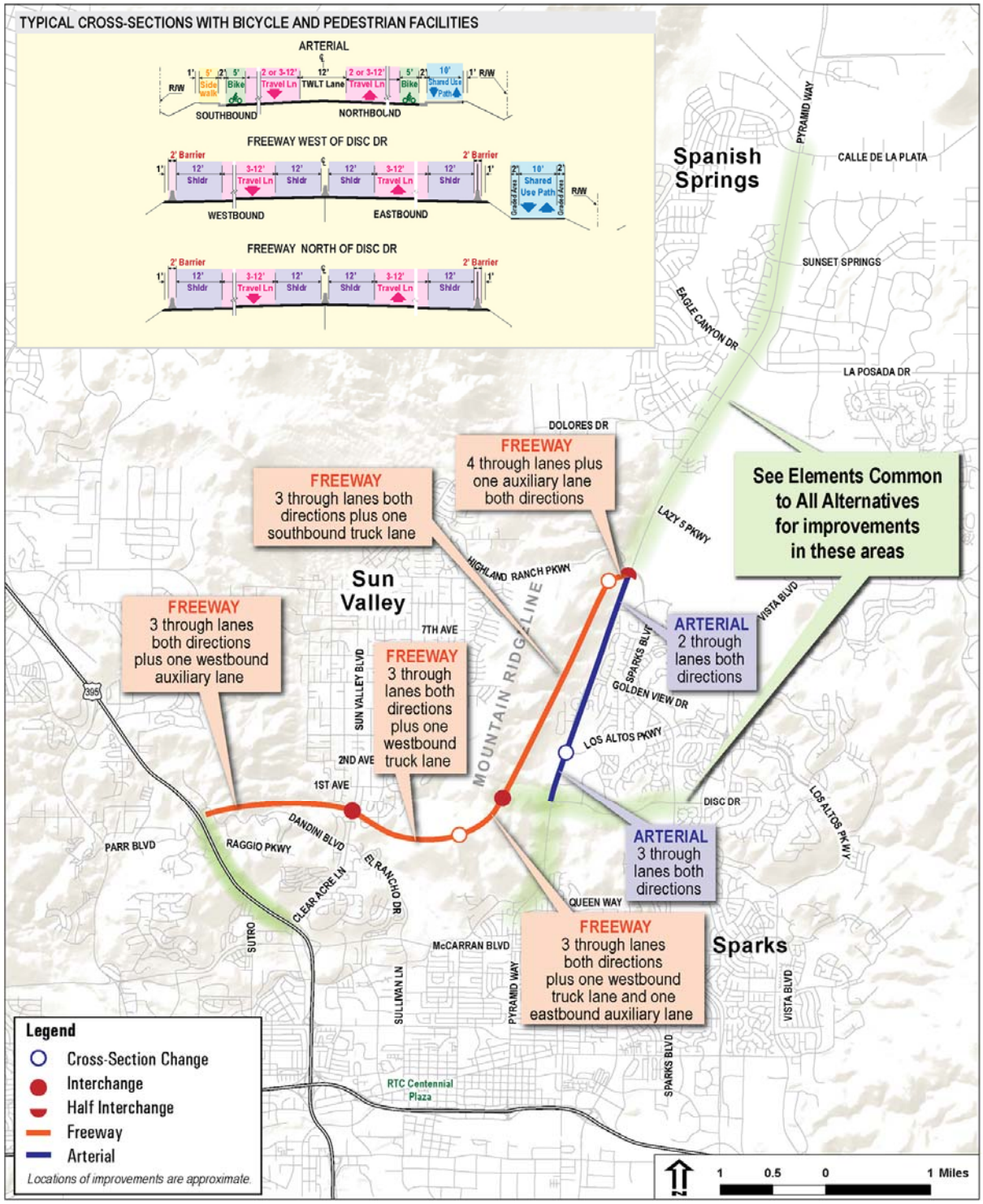
At this time, locations for temporary or permanent storage of excess material have not been identified. Stockpiling this amount of material within the project limits may not be feasible due to the large volume generated. Any off-site hauling of excess material would increase the overall project cost. Storage and/or disposal areas for excess earthwork will be evaluated following selection of the Preferred Alternative, and will factor into evaluation of the build alternatives. Concepts for handling or reducing excess material include:

- Using excess material within other areas within the project limits where fill material is needed.
- Flattening major fill slopes along roadways as a way to increase reuse of excess material.
- Steepening cut slopes along roadways where material is found to be stable.
- Placing material within the infield areas between ramps of areas at interchanges.
- Placing material in support of third party master plan developments.
- Using material to develop and advance proposed regional parks.
- Infilling expended portions of material pits located near the project limits.
- Refining roadway alignment elevations as part of future designs.
- Placing walls in strategic locations to reduce major cuts.

2.4.4 Alternative 1

This section describes the elements included in Alternative 1 beyond the common elements described in Section 2.4.3 *Build Alternatives – Common Elements*.

Alternative 1 shown in Figure 2-10 would be an off- alignment just west of the existing Pyramid Highway between the US 395 Connector and Highland Ranch Parkway. This alignment would be just below the ridgeline of the mountains, west of Walmart. Of the two alignments through Sun Valley, Alternative 1 would follow the Rampion Way crossing and would include an interchange at Sun Valley Boulevard. For the length of the freeway segment from Highland Ranch Parkway to US 395, the typical cross-section would be a six-lane freeway, with auxiliary and/or truck lanes provided where warranted by travel demand or grade.



Note: See Figure 2-9 for elements common to all build alternatives.

Figure 2-10. Alternative 1

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Alternative 1 would have three interchanges, in addition to those common to all alternatives, at the following locations:

- Sun Valley Boulevard
- Disc Drive
- Pyramid Highway south of Sparks Boulevard/Highland Ranch Parkway (existing alignment)

Along the existing Pyramid Highway alignment south of Highland Ranch Parkway, Pyramid Highway would be upgraded to a six-lane arterial between Los Altos Parkway and Disc Drive.

2.4.5 Alternative 2

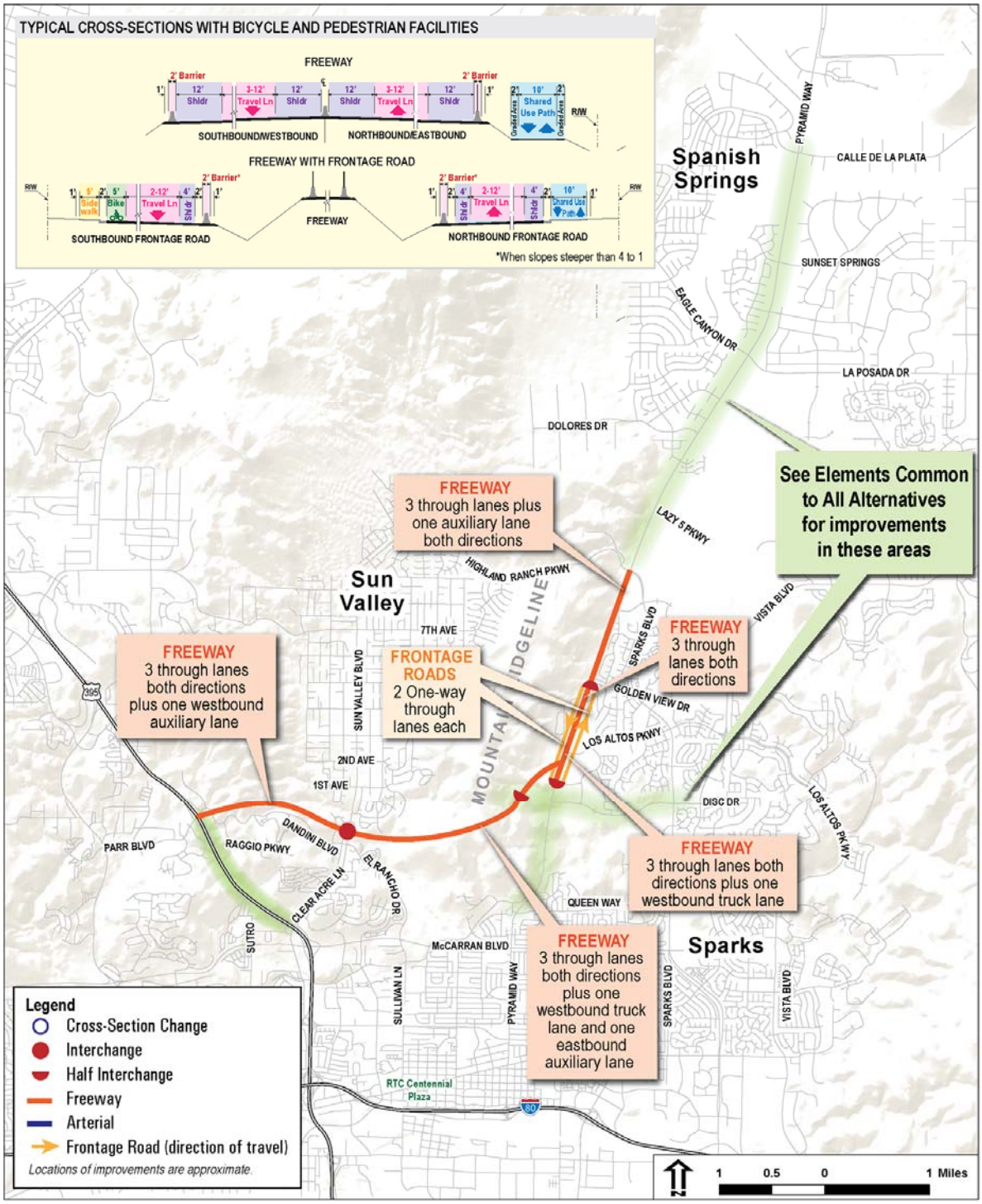
This section describes the elements included in Alternative 2 beyond those described in Section 2.4.3 *Build Alternatives – Common Elements*.

Alternative 2 shown in Figure 2-11 would be an alignment following the existing Pyramid Highway between the US 395 Connector and Sparks Boulevard/Highland Ranch Parkway. This alignment would include a six-lane freeway cross-section between Disc Drive and US 395. Frontage roads would be included between Disc Drive and Golden View. Auxiliary and truck lanes would be provided where warranted by traffic demand or roadway grade. The US 395 Connector alignment would follow the south of Rampion Way crossing of Sun Valley and would include an interchange at Sun Valley Boulevard.

2.4.6 Alternative 3

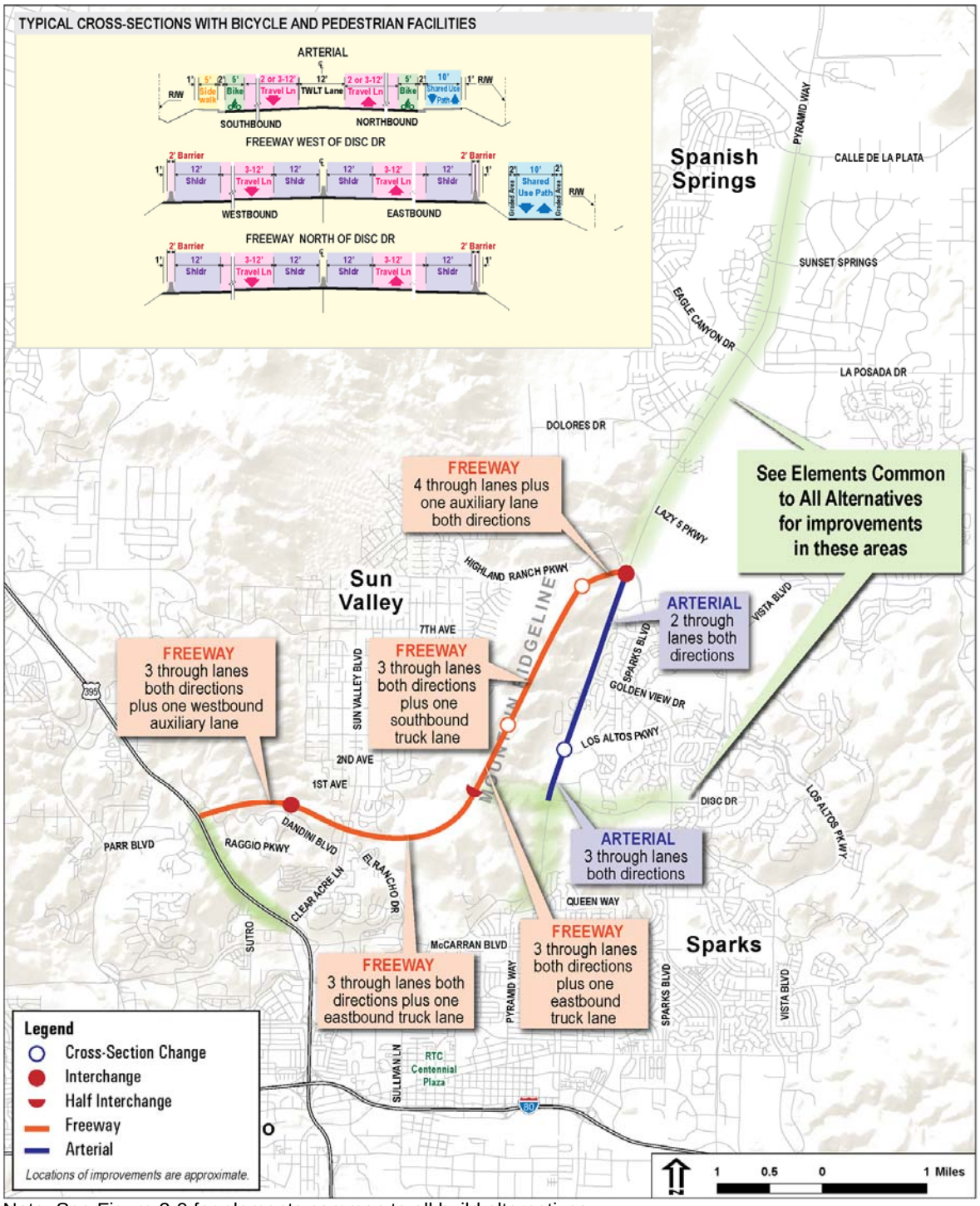
This section describes the elements included in Alternative 3 beyond those described in Section 2.4.3 *Build Alternatives – Common Elements.*

Alternative 3 shown in Figure 2-12 would be an alignment along the ridgeline of the mountains between the US 395 Connector and Highland Ranch Parkway. This alignment would include a directional interchange at the extension of Disc Drive and a directional system interchange with Pyramid Highway south of Sparks Boulevard/Highland Ranch Parkway and would have the typical six-lane freeway cross-section. Auxiliary and truck lanes would be included where warranted by traffic demand or roadway grade. The US 395 Connector alignment would follow the south of Rampion Way crossing and would include an interchange immediately west of Sun Valley Boulevard.



Note: See Figure 2-9 for elements common to all build alternatives.

Figure 2-11. Alternative 2



Note: See Figure 2-9 for elements common to all build alternatives.

Figure 2-12. Alternative 3

2.4.7 Alternative 4

This section describes the elements included in Alternative 4 beyond those described in Section 2.4.3 *Build Alternatives – Common Elements.*

Alternative 4 shown in Figure 2-13 would be an alignment following the existing Pyramid Highway between the US 395 Connector and Sparks Boulevard/Highland Ranch Parkway. This alignment would include a six-lane freeway cross-section between Disc Drive and US 395. Frontage roads would be included between Disc Drive and Golden View. Auxiliary and truck lanes would be included where warranted by traffic demand or roadway grade. The US 395 Connector alignment would follow the Rampion Way crossing and would include an interchange immediately west of Sun Valley Boulevard.

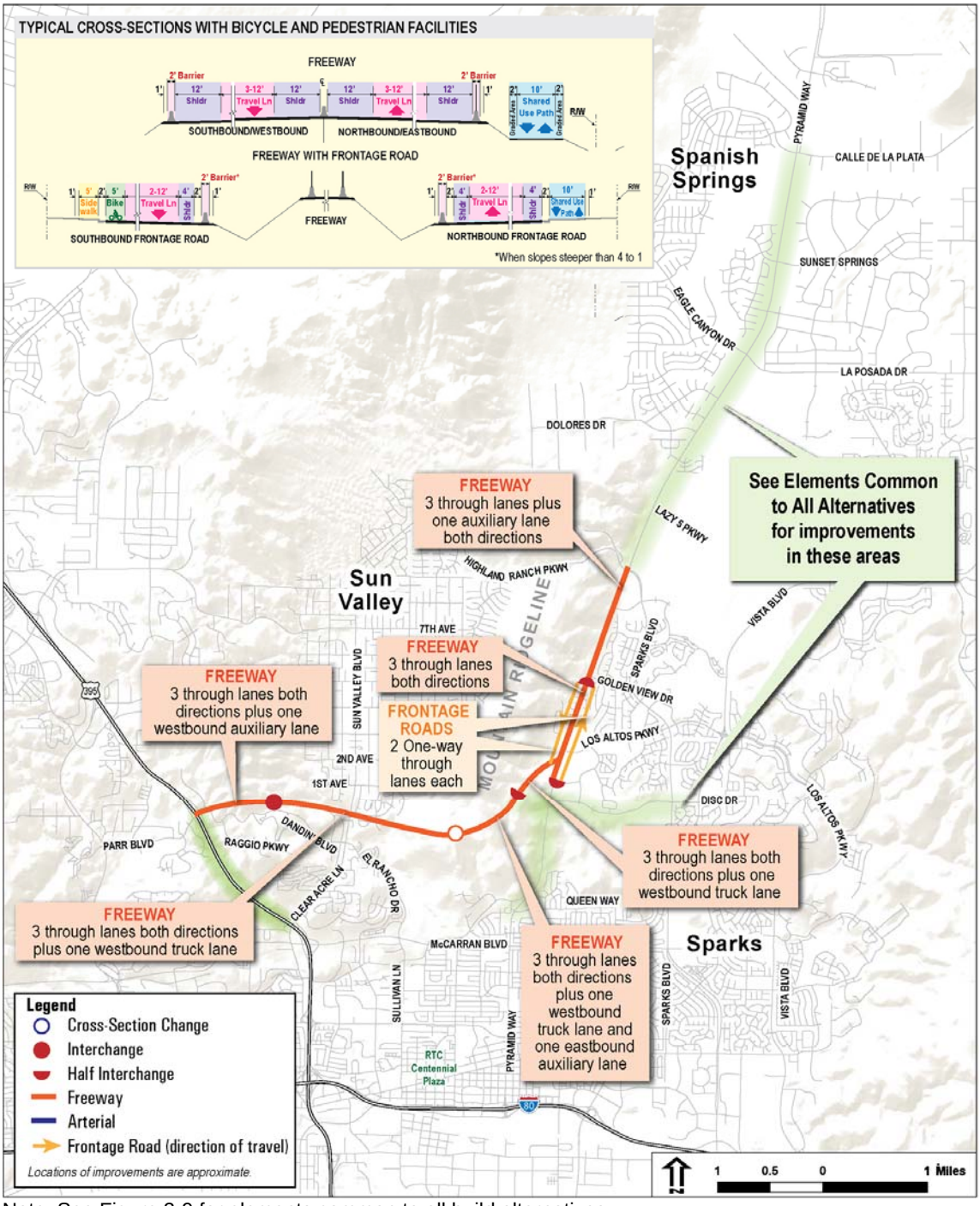
Chapter 3.0 *Environmental Resources, Impacts, and Mitigation* documents the impacts associated with each build alternative and proposed mitigation measures.

2.5 BUILD ALTERNATIVE CONSTRUCTION COST RANGES

Preliminary planning level cost estimates were developed using NDOT software. The costs were estimated in year 2012 construction dollars, and include construction costs, engineering and inspection costs, and costs associated with earthwork, including excavation and hauling. The cost estimates also include traffic control, as well as landscaping and aesthetics, but do not include costs for right-of-way acquisition. After a preferred alternative is selected, a phasing plan and accompanying cost estimate will be developed. Table 2-14 summarizes the estimated cost ranges for each build alternative.

Table 2-14. Build Alternative Construction Cost Range

Build Alternative	Estimated Construction Cost Range (in 2012 dollars)
Alternative 1	$704M to $776M
Alternative 2	$766M to $844M
Alternative 3	$703M to $775M
Alternative 4	$790M to $871M



Note: See Figure 2-9 for elements common to all build alternatives.

Figure 2-13. Alternative 4

Before FHWA can sign the Record of the Decision to complete the EIS process, the project must be included in RTC's fiscally constrained 2035 Regional Transportation Plan (RTP), which indicates that full funding for the project has been identified. Currently, all but the portions of the project located along Pyramid Highway north of Sparks Boulevard and the new US 395 system ramps to/from the north are included in the 2035 RTP. Unless additional funding is identified, the project would be constructed in phases, with funded phases designed and constructed first. Therefore, any build alternative would meet the purpose and need of the project as it is implemented in phases over time.

After a preferred alternative is selected, RTC will evaluate funding availability and the Study Team will evaluate whether to implement a phased ROD approach to move forward the portion of the project that is included in the current 2035 RTP. If so, a phasing plan and associated cost estimate will be developed and included in the Final EIS and ROD.